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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/972,142	10/05/2001	Daniel A. Loffler	220772007420	5182

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MORRISON & FOERSTER LLP  
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EXAMINER

KERNS, KEVIN P

ART UNIT PAPER NUMBER

1725

DATE MAILED: 12/20/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 09/972,142	<b>Applicant(s)</b> LOFFLER ET AL.	
	<b>Examiner</b> Kevin P. Kerns	<b>Art Unit</b> 1725	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 18 November 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-51 is/are pending in the application.
- 4a) Of the above claim(s) 25-48 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-24 and 49-51 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☒ Claim(s) 1-51 are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 05 October 2001 and 16 May 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

**DETAILED ACTION**

***Election/Restrictions***

1. This application contains claims 25-48 drawn to inventions nonelected without traverse. A complete reply to the final rejection must include cancellation of nonelected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.01.

***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1-24 and 49-51 are rejected under 35 U.S.C. 103(a) as being unpatentable over any one of Hamada et al. (US 5,609,834), Furuya et al. (JP 6-111838), or Nakamura et al. (JP 6-219703), in view of Hunter et al. (US 4,214,867).

Hamada et al. disclose a plate reformer for conducting simultaneous endothermic (steam reforming) and exothermic (combustion) reactions via a stack of bicatalytic reactor cells that include a series of first and second reactor channels; a plate-shaped reforming chamber 2 sandwiched between a pair of plate-shaped combustion chambers 4, all of which contain respective heat exchange sections (plates 5); a plurality of coated thin metal, heat-conductive separator plates and fuel distribution plates 6 for transverse flow of a reaction stream, and forming corrugated regions via a plurality of spheres; a heater operative to preheat a reaction stream; and an inlet and an outlet for the exothermic and endothermic reaction streams, such that the bicatalytic reactor cell is operative to supply an anode 41a of a fuel cell 40 with hydrogen gas (abstract; column 1, lines 6-9; column 2, lines 66-67; column 3, lines 1-67; column 4, lines 1-31 and 55-67; column 5, line 1 through column 8, line 54; and Figures 1-3).

In addition, Furuya et al. disclose a reforming system for supplying a fuel cell system, in which reforming catalysts are placed on the grooves of one side plate and combustion catalysts are placed on the grooves of the other side plate, creating reaction fluid flow passages, with the reforming system operative to conduct simultaneous endothermic (steam reforming) and exothermic (combustion) reactions via a stack of bicatalytic reactor cells that include a series of first and second reactor channels; a plate-shaped reforming chamber and a combustion chamber, both of which contain heat

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exchange sections; a plurality of coated thin metal, heat-conductive separator plates and fuel distribution plates for transverse flow of a reaction stream, and forming corrugated regions via a plurality of spheres; and a heater operative to preheat a reaction stream; and an inlet and an outlet for the exothermic and endothermic reaction streams, such that the bicatalytic reactor cell is operative to supply an anode of a fuel cell with hydrogen gas (abstract; and Figures 1-19).

Also, Nakamura et al. disclose a miniaturized fuel reformer for conducting simultaneous endothermic (steam reforming) and exothermic (combustion) reactions via a stack of bicatalytic reactor cells that include a series of first and second reactor channels; a plate-shaped reforming chamber and a plate-shaped combustion chamber, both of which contain heat exchange sections; a plurality of coated thin metal, heat-conductive separator plates and fuel distribution plates for transverse flow of a reaction stream, and forming corrugated regions; a heating unit 112 operative to preheat a reaction stream; and an inlet and an outlet for the exothermic and endothermic reaction streams, such that the bicatalytic reactor cell is operative to supply an anode of a fuel cell with hydrogen gas (abstract; and Figures 1-4).

Although neither Hamada et al., Furuya et al., nor Nakamura et al. discloses the specific metal alloy materials, thicknesses and distances between the thin metal separators, and the herringbone pattern of the flow of the reaction stream (which is higher than atmospheric pressure in the first and second reaction channels per new claims 50 and 51), one of ordinary skill in the art would have recognized that the specific metal alloy material, thicknesses/distances of the thin metal separators, and a

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herringbone pattern of flow (as compared to conventional parallel flow), would have been obvious to obtain a more efficient and miniaturized bicatalytic reactor cell

Neither Hamada et al., Furuya et al., nor Nakamura et al. specifically discloses the amended claim 1 limitations that include at least a portion of a first catalyst-coated surface is directly opposite at least a portion of a second catalyst-coated surface on opposing sides of a separator that is shaped to form corrugations.

However, Hunter et al. disclose a method and apparatus for catalytic heat exchange, in which a separator is coated with catalyst to form directly opposed surfaces for heat exchange, in which the separator (membrane) is in the form a corrugated metal strip or foil, which is advantageous for providing improved catalytic combustion and heat exchange for carrying out simultaneous reactions (abstract; column 1, line 14 through column 6, line 62; and Figures 1-3).

It would have been obvious to one of ordinary skill in the art at the time the applicants' invention was made to modify the respective structures of the reformers disclosed by any one of Hamada et al., Furuya et al., or Nakamura et al., by using the separator (membrane) formed of corrugated metal strip or foil to form directly opposed surfaces for heat exchange, as taught by Hunter et al., in order to provide improved catalytic combustion and heat exchange for carrying out simultaneous reactions (Hunter et al.; abstract; and column 6, lines 44-62).

***Response to Arguments***

5. The examiner acknowledges the applicants' amendment provided with the request for continued examination received by the USPTO on November 18, 2005. The prior response to the applicants' request for rejoinder (pages 14-16 of applicants' remarks) remains valid (see paragraphs 1 and 6 of this Office Action), and was presented in paragraph 1 of the final rejection mailed July 19, 2005. The applicants have added new claims 50 and 51. Claims 1-24 and 49-51 are currently under consideration in the application.

6. Applicants' arguments filed November 18, 2005 have been fully considered but they are not persuasive.

With regard to the applicants' remarks/arguments on pages 14-17 of the amendment, the examiner respectfully disagrees with the applicants' request for rejoinder on pages 14-16, as there are no product claims in the withdrawn claims, and the claims were elected without traverse. The initial Office Action of July 12, 2004 (requirement for election/restriction) sets forth the rationale detailing the distinctly claimed inventions. As a result, the applicants are suggested to cancel the nonelected claims and present them in one or more divisional applications for further consideration (also see above paragraph 1). Regarding the remarks on pages 16 and 17 (addressing the rejections under 35 USC 103(a)), the examiner respectfully disagrees with the applicants' characterization of the Hunter et al. reference, as all three primary references in paragraph 4 set forth the structural elements of reformers as claimed, with

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the exception of the distinct arrangement of corrugations. However, Hunter et al. disclose this structural feature in an analogous catalytic heat exchange environment, and its combination with any of the three primary references is advantageous for providing improved catalytic combustion and heat exchange for carrying out simultaneous reactions (see paragraph 4).

In response to applicants' argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Hunter et al. include the motivation to provide improved catalytic combustion and heat exchange for carrying out simultaneous reactions (see paragraph 4).

### ***Conclusion***

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Kevin P. Kerns whose telephone number is (571) 272-1178. The examiner can normally be reached on Monday-Friday from 8:00am-5:00pm.



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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Kevin P. Kerns *Kevin Kerns 12/8/05*  
Primary Examiner  
Art Unit 1725

*KPK*

kpk

December 8, 2005